Nonvolatile SRAMs

Benchmarq's nonvolatile static random-access memories (NVSRAMs) integrate—in a single-DIP package—extremely low standby power SRAM, nonvolatile control circuitry, and a long-life lithium cell. The NVSRAMs combine secure nonvolatility (more than 10 years in the absence of power) with standard SRAM pin-outs and fast unlimited read/write operation.

Nonvolatile SRAM Selection Guide

Part No.*	Density	Config-uration	Tech-nology	Access Time (ns)	Pins / Package	Available
bq4010	64 Kb	8 Kb x 8	NVSRAM	70, 85, 150, 200	28 / DIP	Now
bq4011	256 Kb	32 Kb x 8	NVSRAM	70, 100, 150, 200	28 / DIP	Now
bq4013	1 Mb	128 Kb x 8	NVSRAM	70, 85, 120	32 / DIP	Now
bq4014	2 Mb	256 Kb x 8	NVSRAM	85, 120	32 / DIP	Now
bq4024		128 Kb x 16	NVSRAM	85, 120	40 / DIP	Now
bq4015	4 Mb	512 Kb x 8	NVSRAM	70, 85, 120	32 / DIP	Now
bq4025		256 Kb x 16	NVSRAM	85, 120	40 / DIP	Now
bq4115		512 Kb x 8	NVPSRAM	150	40 / DIP	Now
bq4016	8Mb	1024Kb x 8	NVSRAM	70	36 / DIP	Now
bq4017	16 Mb	2048 Kb x 8	NVSRAM	70	36 / DIP	Now

Notes: V_{CC} = -5%, +10%; "Y" suffix versions for V_{CC} = ±10%.
Most devices are available in industrial temperature.

Nonvolatile Controllers

The nonvolatile controllers provide power monitoring, write protection, and supply switching to convert standard SRAM and a backup battery into a reliable, predictable nonvolatile memory. The nonvolatile controller *modules* are complete battery-backup solutions including an encapsulated 130mAh lithium cell that is isolated until power is applied.

Nonvolatile Controller Selection Guide

Part No.	SRAM Banks	Battery Monitor Outputs	Reset Output	I_{OUT}	Pins / Package	Available
bq2201	1	No	No	160 mA	8 / NDIP, NSOIC	Now
bq2202	2	No	Yes	160 mA	16 / NDIP, NSOIC	Now
bq2203A	2	Yes	Yes	160 mA	16 / NDIP, NSOIC	Now
bq2204A	4	No	No	160 mA	16 / NDIP, NSOIC	Now
bq2212	2	Yes	Yes	80 mA	16 / NDIP, NSOIC	Now
bq2502	2	No	Yes	160 mA	12 / DIP Module	Now

Note: bq2201, bq2202, and bq2204A are available in industrial temperature.

Benchmarq Microelectronics, Inc., founded in 1989, has a worldwide presence in the power-sensitive and portable electronic systems marketplace. With sales offices and representatives in more than 25 countries, Benchmarq has earned its reputation for providing integrated IC and module solutions that address real-world problems in managing battery-operated, low-power, and power-sensitive equipment. Benchmarq's solutions are adopted by leading-edge corporations producing personal computers, cellular phones, telecommunications equipment, and portable electronic systems.

Benchmarq is the recognized leader in battery management integrated circuits, with a family of ICs that provide fast charge control and available capacity monitoring for nickel cadmium, nickel metal-hydride, lead acid, lithium-ion, and rechargeable alkaline batteries. Benchmarq is a reliable and competitive supplier of nonvolatile solutions, including supervisory controller and real-time clock ICs as well as controller, static RAM, pseudo static RAM, and RTC battery-integrated modules.

Benchmarq's products take full advantage of advanced analog and digital VLSI technologies and state-of-the-art battery and packaging expertise. Benchmarq is committed to providing high-value solutions for today's power-sensitive and portable applications and to developing creative products for the growing challenges of tomorrow—supported by the best customer service and the highest overall quality.

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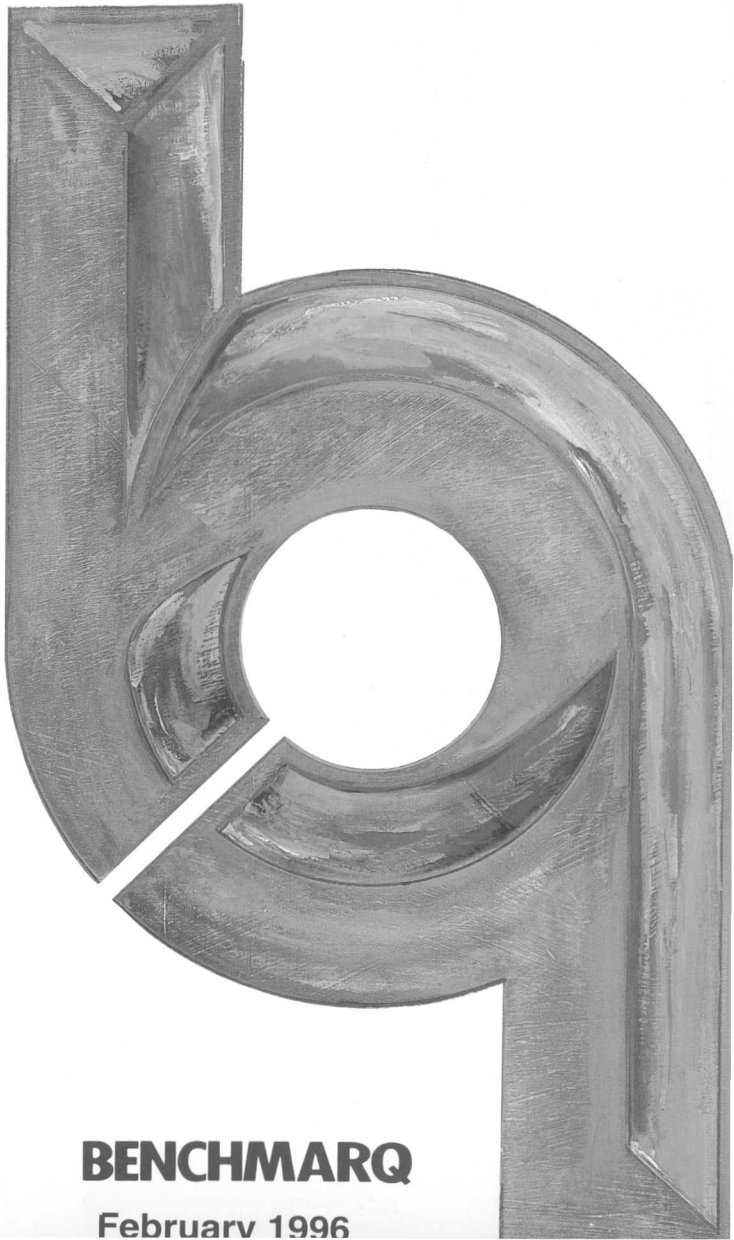
Integrated solutions for portable and power-sensitive electronic systems



BENCHMARQ

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Battery Management

Benchmarq's battery-management family of ICs provide "gas gauge" capacity monitoring, fast charge control, and sophisticated battery conditioning for nickel cadmium, nickel metal-hydride, lead acid, lithium ion, and rechargeable alkaline battery-operated systems. Development systems provide an application development environment for short design-in cycles.

Gas Gauge ICs

The bq20xx family of Gas Gauge ICs integrate all of the necessary functions for a smart battery into a single IC. Benchmarq's Gas Gauge ICs measure the available charge, calculate self-discharge, and optionally provide available charge information via a serial port or direct LED display. The total bq20xx circuit typically requires less than 1/2 square inch of board space, small enough to fit in the crevice between two "A" type cells. The Gas Gauge ICs integrate capacity monitoring and charge control, provide SMBus-compatibility, include solutions for the power tool industry (applications with very high discharge currents), and support nickel cadmium, nickel metal-hydride, lead acid, lithium ion, and primary and rechargeable alkaline chemistries. Benchmarq module products provide customer-specific total smart battery and charge control solutions on customized PCBs.

Gas Gauge IC Selection Guide

Part No.	Description	Capacity Information	Fast Charge Control	Pins / Package	Available
bq2010	Gas Gauge IC	6 LEDs, serial port	—	16 / 0.300" NDIP, 0.150" NSOIC	Now
bq2011	Gas Gauge IC, high discharge rate	5 LEDs, serial port	—	16 / 0.300" NDIP, 0.150" NSOIC	Now
bq2011J	Gas Gauge IC, high discharge rate	5 LEDs, serial port	—	16 / 0.300" NDIP, 0.150" NSOIC	Now
bq2012	Gas Gauge IC, charge control	6 LEDs, serial port	Gas gauge, max. temp.	16 / 0.300" NDIP, 0.150" NSOIC	Now
bq2014	Gas Gauge IC, external charge control	5 LEDs, serial port	Ext. control using ΔV, ΔT/Δt	16 / 0.300" NDIP, 0.150" NSOIC	Now
bq2050	Li-Ion Power Gauge™ IC	5 LEDs, serial port	—	16 / 0.300" NDIP, 0.150" NSOIC	Now
EV2010/11/12/14/14x	Gas Gauge Evaluation Systems for bq2010/bq2011/bq2012/bq2014/bq2014+bq2004				Now
EV2050	Li-Ion Power Gauge™ Evaluation System for bq2050				Now
EV2050x	Li-Ion Evaluation System for bq2050/bq2053/bq2004(E)				Now
bq2110/12/14	bq2010/bq2012/bq2014 Gas Gauge Modules				Now
bq2110L/11L/12L/14L	bq2010/bq2011/bq2012/bq2014 Gas Gauge Modules With LEDs				Now
bq2140L	bq2040 SMBus Gas Gauge Module With LEDs				Now
bq2150	bq2050 Lithium-Ion Power Gauge™ Module				Now
bq2164	Gas Gauge Module With Fast Charge Control				Now
bq2165	Li-Ion Gas Gauge Module With Pack Supervision				Now

Fast Charge ICs

The Fast Charge IC family provides fast charge termination, switch-mode current regulation, battery charge qualification, and conditioning for nickel cadmium, nickel metal hydride, lead acid, lithium ion, and rechargeable alkaline batteries. These ICs are easily integrated into systems or can be used in stand-alone chargers.

Benchmarq's Fast Charge ICs are used to gate a current source or serve as the modulator for a switching-mode constant-current regulator. Using ΔT/Δt termination allows in-system variable-rate charging, where the excess supply current charges batteries during system operation.

Prior to fast charge, the ICs check the battery for temperature and voltage faults. Direct LED outputs display battery and charge status. Fast charge termination methods include delta temperature/delta time (ΔT/Δt), negative delta voltage (-ΔV), peak voltage detection (PVD), minimum current, maximum temperature, maximum time, and maximum voltage. Discharge-before-charge, top-off charge, and maintenance charge options are provided.

Fast Charge IC Selection Guide

Part No.	Charge Control Output	Battery Technology	Termination Method	Pins / Package	Available
bq2002	Single	NiCd, NiMH	-ΔV, PVD, max. temp. and time	8 / 0.300" DIP, 0.150" SOIC	Now
bq2002T	Single	NiCd, NiMH	ΔT/Δt, max. temp. and time	8 / 0.300" DIP, 0.150" SOIC	Now
bq2003	Single	NiCd, NiMH, Lead Acid	-ΔV, ΔT/Δt, max. temp., voltage, and time	16 / 0.300" DIP, 0.300" SOIC	Now
bq2004	Single	NiCd, NiMH Li-Ion	-ΔV, PVD, ΔT/Δt, max. temp., voltage, and time	16 / 0.300" DIP, 0.150" SOIC	Now
bq2004E	Single	NiCd, NiMH Li-Ion	-ΔV, PVD, ΔT/Δt, max. temp., voltage, and time	16 / 0.300" DIP, 0.150" SOIC	Now
bq2005	Dual	NiCd, NiMH	-ΔV, ΔT/Δt, max. temp., voltage, and time	20 / 0.300" DIP, 0.300" SOIC	Now
bq2007	Single	NiCd, NiMH	-ΔV, PVD, max. temp., voltage, and time	24 / 0.300" DIP, 0.300" SOIC	Now
bq2031	Single	Lead Acid	Max. voltage, min. current, max. temp., and time	16 / 0.300" DIP, 0.150" SOIC	Now
bq2053	2–4 cells	Li-Ion	Max./min. voltage, overcurrent	8 / 0.300" DIP, 0.150" SOIC	Now
bq2054	Single	Li-Ion	Max. voltage, min. current, max. temp., and time	16 / 0.300" DIP, 0.150" SOIC	1Q96
bq2902	2 cells	Rechargeable Alkaline	Maximum voltage	8 / 0.300" DIP, 0.150" SOIC	1Q96
bq2903	3 or 4 cells	Rechargeable Alkaline	Maximum voltage	14 / 0.300" DIP, 0.150" SOIC	1Q96
bq2153	Li-Ion Pack Supervisor Module With bq2053				Now
bq2193	Rechargeable Alkaline Charger Module With bq2903				1Q96
DV2002L	Linear Development System for bq2002				Now
DV2002TL	Linear Development System for bq2002T				Now
DV2003L/S	Linear/Switching Development Systems for bq2003				Now
DV2004L/S	Linear/Switching Development Systems for bq2004				Now
DV2004ES	Switching Development Systems for bq2004E				Now
DV2005L/S	Linear/Switching Development Systems for bq2005				Now
DV2007S	Switching Development System for bq2007				Now
DV2031S	Switching Development System for bq2031				Now
EV2903	bq2903 Evaluation System				Now

Real-Time Clocks (RTC)

Benchmarq's family of real-time clocks (RTCs) provide highly integrated clock/calendar solutions for microcomputer-based designs. The RTCs feature a time-of-day clock, a 100-year calendar, and RAM with battery-backup operation.

The RTCs are available as an IC or as a module. The module integrates the IC, crystal, and battery to save board space and provide 10 years of data retention and clock operation in the absence of power. The low-power IC requires only a backup battery and crystal for operation. NVSRAM controller versions allow users to make inexpensive SRAM nonvolatile for data and configuration storage in computers, portable equipment, office machines, and other applications.

The PC AT-compatible (address/data multiplexed) RTCs are available with 3V or 5V operation and have either 114 or 242 bytes of nonvolatile storage RAM. Other features include three maskable interrupts and a programmable square-wave output.

Benchmarq's high-density RTC modules have standard SRAM pinouts and interfaces. The modules have 32Kbytes or 128Kbytes of nonvolatile memory and provide a self-contained battery backed-up RTC/SRAM solution. The bq4832Y and bq4842Y feature a built-in CPU supervisor with a microprocessor reset and a watchdog timer. The bq4845 IC and the bq4847 module have no onboard memory but integrate an NVSRAM controller with the RTC and CPU supervisor to allow for easy nonvolatile memory expansion.

Real-Time Clock Selection Guide

Part No.	Onboard RAM (bytes)	Operating Voltage	Bus Interface	CPU Supervisor	Pins / Package	Available
bq3285	114	5V	Muxed	No	24 / DIP, SOIC 28 / PLCC	Now
bq3285E	242	5V	Muxed	No	24 / DIP, SOIC, SSOP, 28 / PLCC	Now
bq3285L	242	3V	Muxed	No	24 / DIP, SOIC, SSOP	Now
bq3287/ bq3287A	114	5V	Muxed	No	24 / DIP Module	Now
bq3287E/ bq3287EA	242	5V	Muxed	No	24 / DIP Module	Now
bq4285	114 + external RAM control	5V	Muxed	No	24 / DIP, SOIC 28 / PLCC	Now
bq4285E	114 + external RAM control	5V	Muxed	No	24 / DIP, SOIC, SSOP, 28 / PLCC	Now
bq4285L	114 + external RAM control	3V	Muxed	No	24 / DIP, SOIC, SSOP	Now
bq4287	114 + external RAM control	5V	Muxed	No	24 / DIP Module	Now
bq4287E	114 + external RAM control	5V	Muxed	No	24 / DIP Module	Now
bq4830Y	32K	5V	SRAM	No	28 / DIP Module	Now
bq4832Y	32K	5V	SRAM	Yes	32 / DIP Module	Now
bq4842Y	128K	5V	SRAM	Yes	32 / DIP Module	Now
bq4845/Y	0 + external RAM control	5V	SRAM	Yes	28 / DIP, SOIC	Now
bq4847/Y	0 + external RAM control	5V	SRAM	Yes	28 / DIP Module	Now

Note: bq3285E, bq4285E, and bq4845Y are available in industrial temperature.